

POWTS

Private Onsite Wastewater Treatment Systems

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St. Croix County Land Use Specialist

Authority

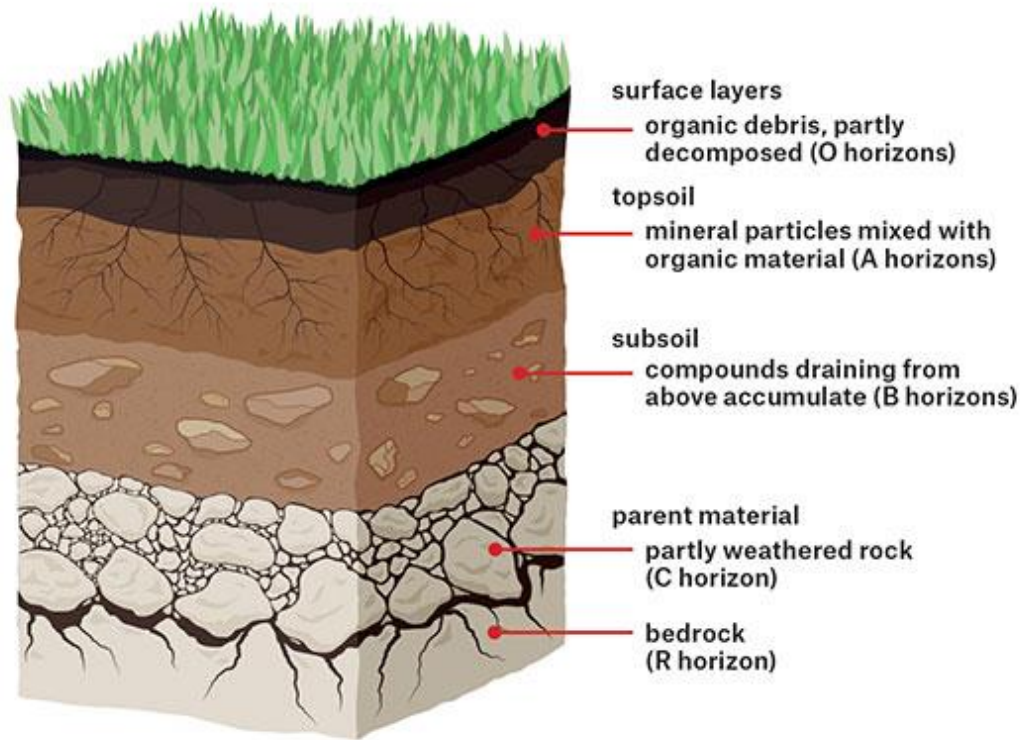
- Wisconsin State Statute 145.13 Adoption of Plumbing authorizes “the department” or in our case the Department of Safety and Professional Services (SPS) to promulgate performance standards in the form of Wisconsin Administrative Code SPS Chapter 383-385.
- Wisconsin State Statute 145.01(05) “Governmental Unit responsible for the regulation of private sewage systems” or “governmental unit” unless otherwise qualified, means the county.
- Uniform statewide coverage. Counties cannot be more restrictive.

Purpose



SPS 383.01 Purpose.

The purpose of this chapter is to establish uniform standards and criteria for the design, installation, inspection, and management of a private wastewater treatment system, POWTS, so that the system is safe and will protect public health and the waters of our state.



The first step is having a soil test completed:

Is this the same as a Perc test?

The soil test indicates the type and size of POWTS that can be installed. The soil test also determines a limiting factor.

SOIL AND SITE EVALUATION
in accord with Comm 83.05, Wis. Adm. Code

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Environmental By Design

County: St. Croix
Parcel ID #: 17/25/19
Revised By: J. Delong
Date: 7/25/19

PROPERTY INFORMATION - Please print all information.
Information you provide may be used for secondary purposes.

Property Owner: Brown, Brett & Dawn
Property Owner's Mailing Address: 158 Greston Rd
City: New Richmond State: WI Zip Code: 54017
Property Location: SW 1/4 SW 1/4 S 36 T 29 N R 18 W
Lot #: 4 Block #: Subd. Name or CSM#: Margaret Cave
City: Warren Village Town: Nearest Road: 60th Avenue

☒ New Construction Use: ☒ Residential Number of bedrooms: 3 ☐ Addition to existing building
☐ Replacement Use: ☐ Public or commercial describe: _____

Code Derived daily flow: 450 gpd Recommended design loading rate: 1.2 bed, gpd/ft² 1.2 trench, gpd/ft²
Absorption area required: 375 bed, ft² 375 trench, ft² Maximum design loading rate: 1.2 bed, gpd/ft² 1.2 trench, gpd/ft²
Recommended infiltration surface elevation(s): 99.50' ft (as referred to site plan benchmark)

Additional design / site considerations: _____

Parent material: Loss Over placial Outwash Flood plain elevation, if applicable: Na ft

S=Suitable for system U=Unsuitable for system Conventional ☒ S ☐ U Mound ☐ S ☐ U In-Ground Pressure ☐ S ☐ U AT-Grade ☐ S ☐ U System in Fill ☐ S ☐ U Holding Tank ☐ S ☐ U

SOIL DESCRIPTION REPORT

Boring#	Horizon	Depth in.	Dominant Color	Mottles	Qu. Sz. Cont. Color	Texture	Structure Gr. Sz. Sh.	Consistence	Boundary	Roots	GPD/ft ²	
											Bed	Trench
1	1	0-7	10yr3/2	-	-	sil	2msbk	mfr	cw	2f	.5	.6
	2	7-18	7.5yr4/4	-	-	sl	2msbk	mfr	cw	1f	.5	.6
	3	18-43	7.5yr5/6	-	-	s	0sg	ml	cw	-	.7	.8
	4	43-48	7.5yr4/4	f1f5yr3/6	-	lfs	2fbbk	mvfr	cw	-	.5	.6
Ground elev		97.49 ft										
Depth to limiting factor		43'										
Remarks:												
2	1	0-7-10	10yr3/2	-	-	sil	2msbk	mfr	cw	2f	.5	.6
	2	10-32	7.5yr4/4	-	-	sl	2msbk	mfr	cw	1f	.5	.6
	3	32-40	7.5yr5/6	f1f5yr3/6	-	sl	0m	mvfr	cw	-	.3	.4
Ground elev		95.92 ft										
Depth to limiting factor		32'										
Remarks:												

- A limiting factor could be bedrock, groundwater, or indicators of seasonal saturation called “Mottles”
- SPS 383 requires a 36 inch separation between an infiltrative surface and the limiting factor.

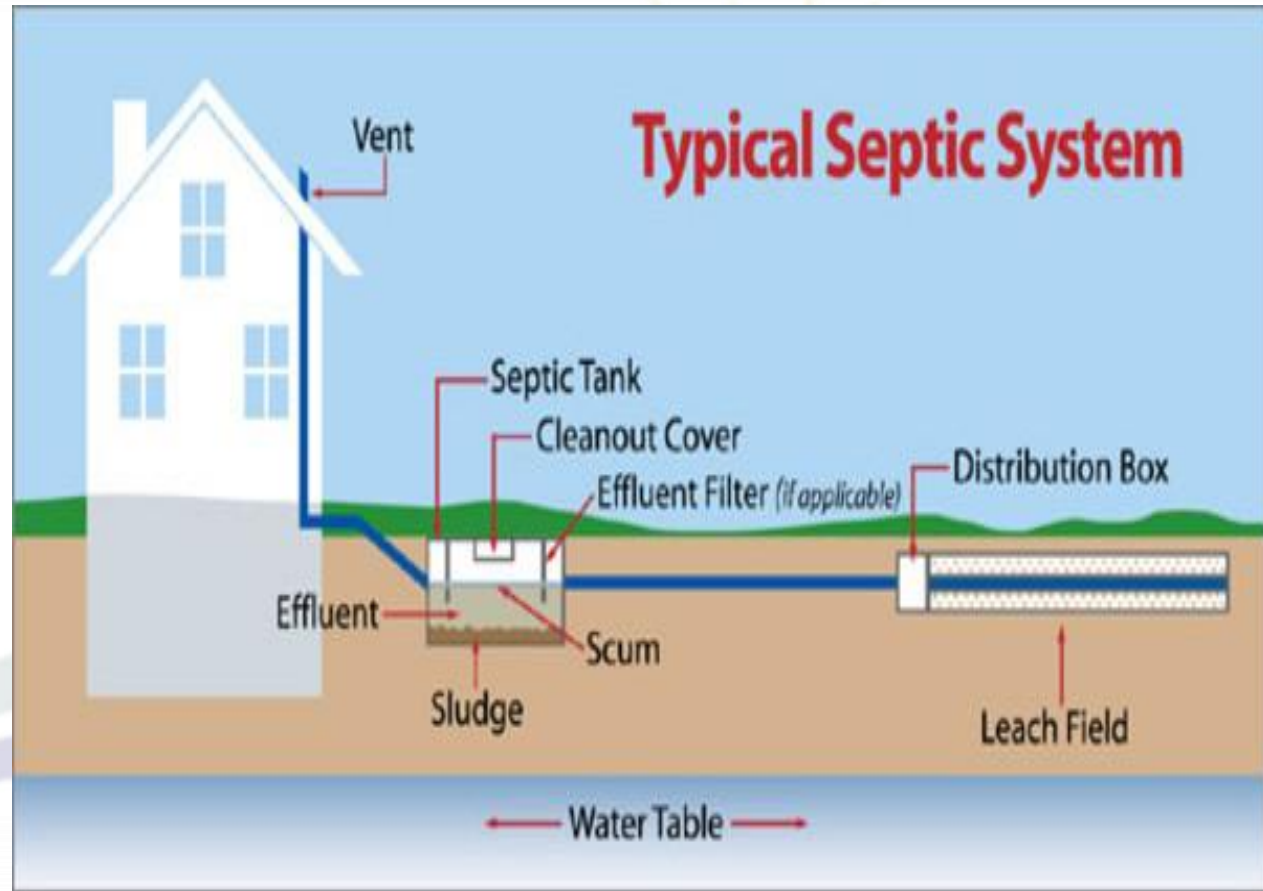




Shallow Bedrock

What are the different types of POWTS (Septic Systems)

1. Non pressurized Inground or Conventional
2. At-Grades
3. Mounds
4. Holding Tanks
5. Dry Wells
6. Privys



Septic Tank



Septic Tank with Aerobic Treatment



Effluent Filter



Non Pressurized Inground Chambers



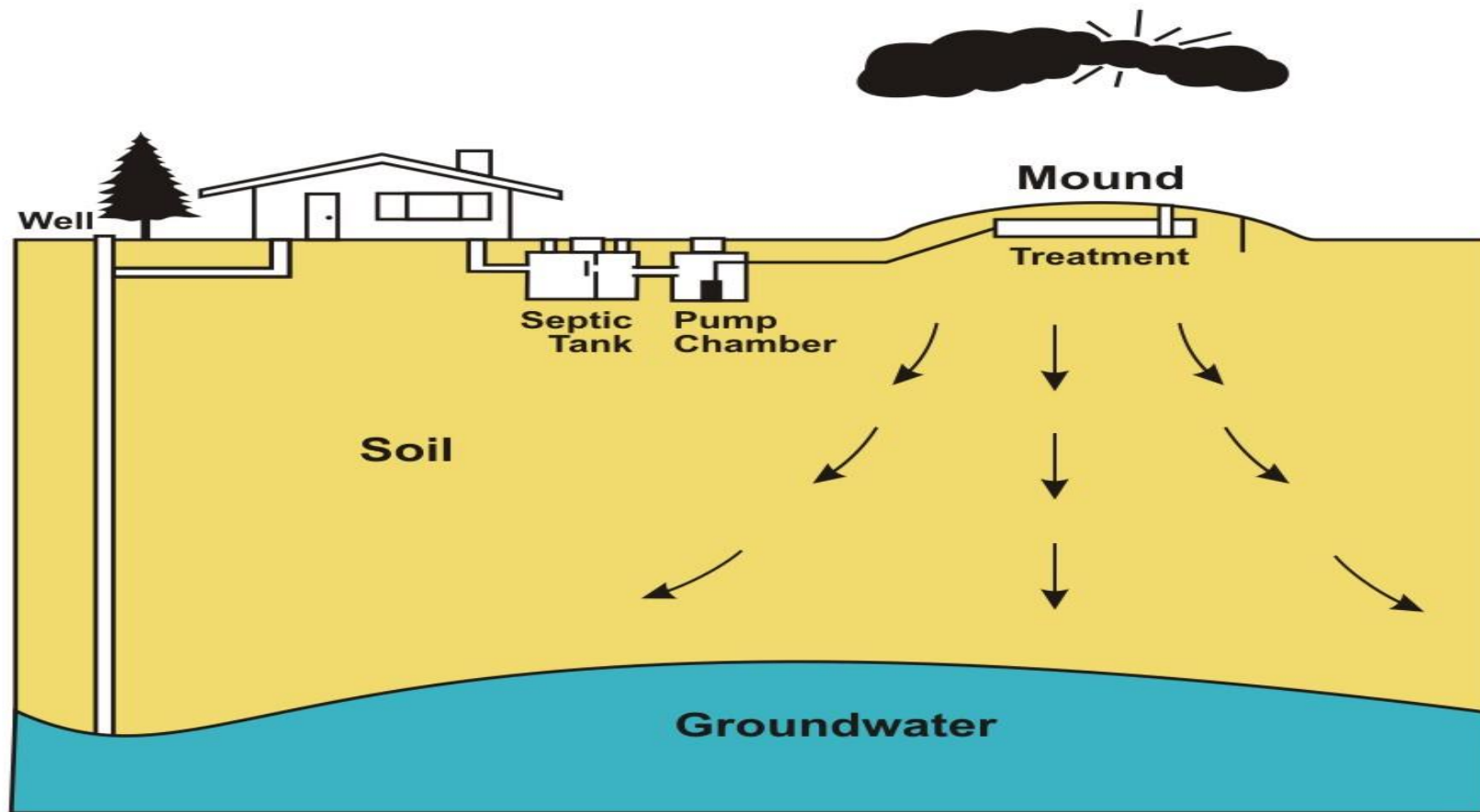
Non Pressurized Inground Chambers



Non pressurized Inground EZ Flows



Mound System Cross Section



Preparing a Mound or At-Grade Site



Mound Installation



SCHMITT & SONS
EXCAVATING

Mound System



Dry Wells

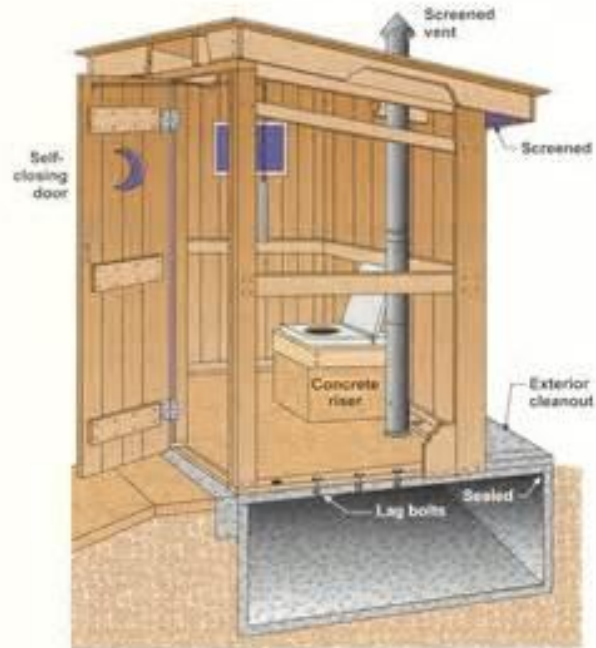


Dry well in place



Vault and Pit Privies

The illustration below shows some of the regulatory requirements for a privy.



What are we trying to protect ourselves and the environment from?

1. Nutrients-Nitrates and Phosphorus
2. Pharmaceuticals-Acetaminophen
3. Pathogens-Viruses and Bacteria





How do POWTS remove Pathogens and Nutrients?

Wastewater Treatment

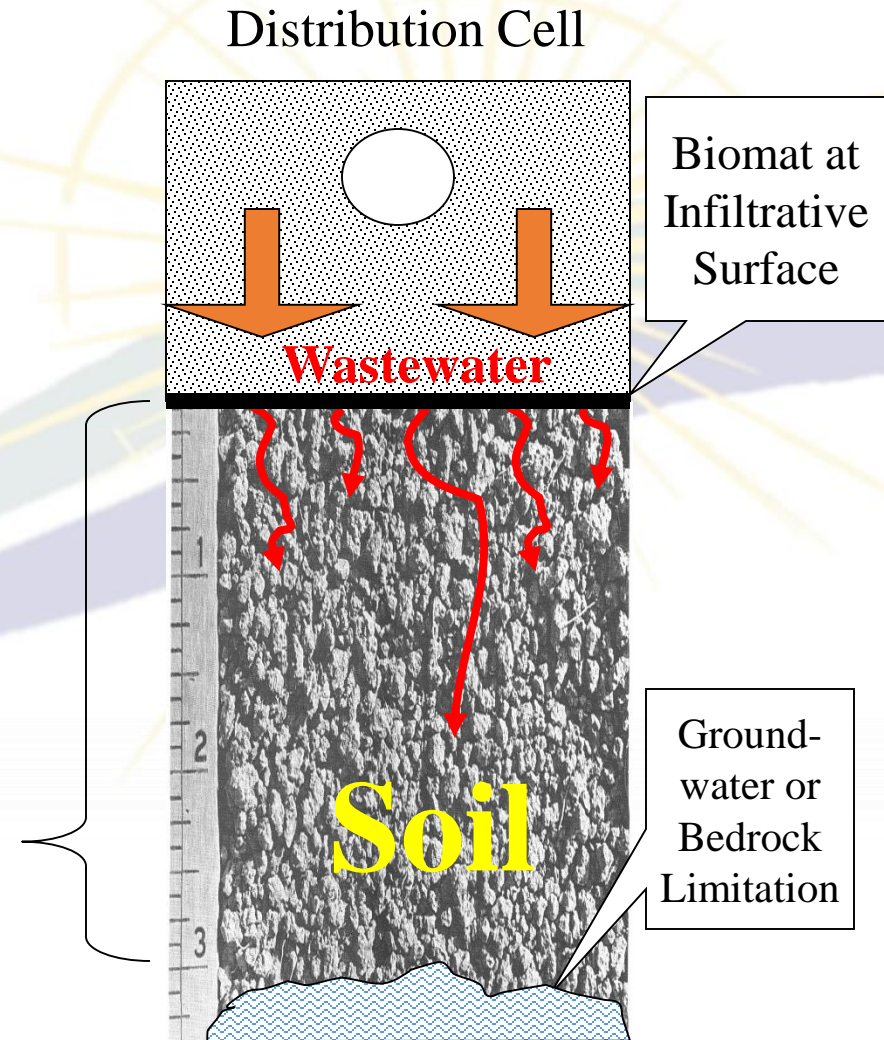
Soil Treatment

- **Treatment Mechanisms**

- Filtration
 - Biomat - good filter
- Adsorption (CEC)
 - Nutrients (+ charged)
- Biochemical
 - Predation, conversion
 - Vegetative uptake
- Retention Time
 - Deactivation (die-off)

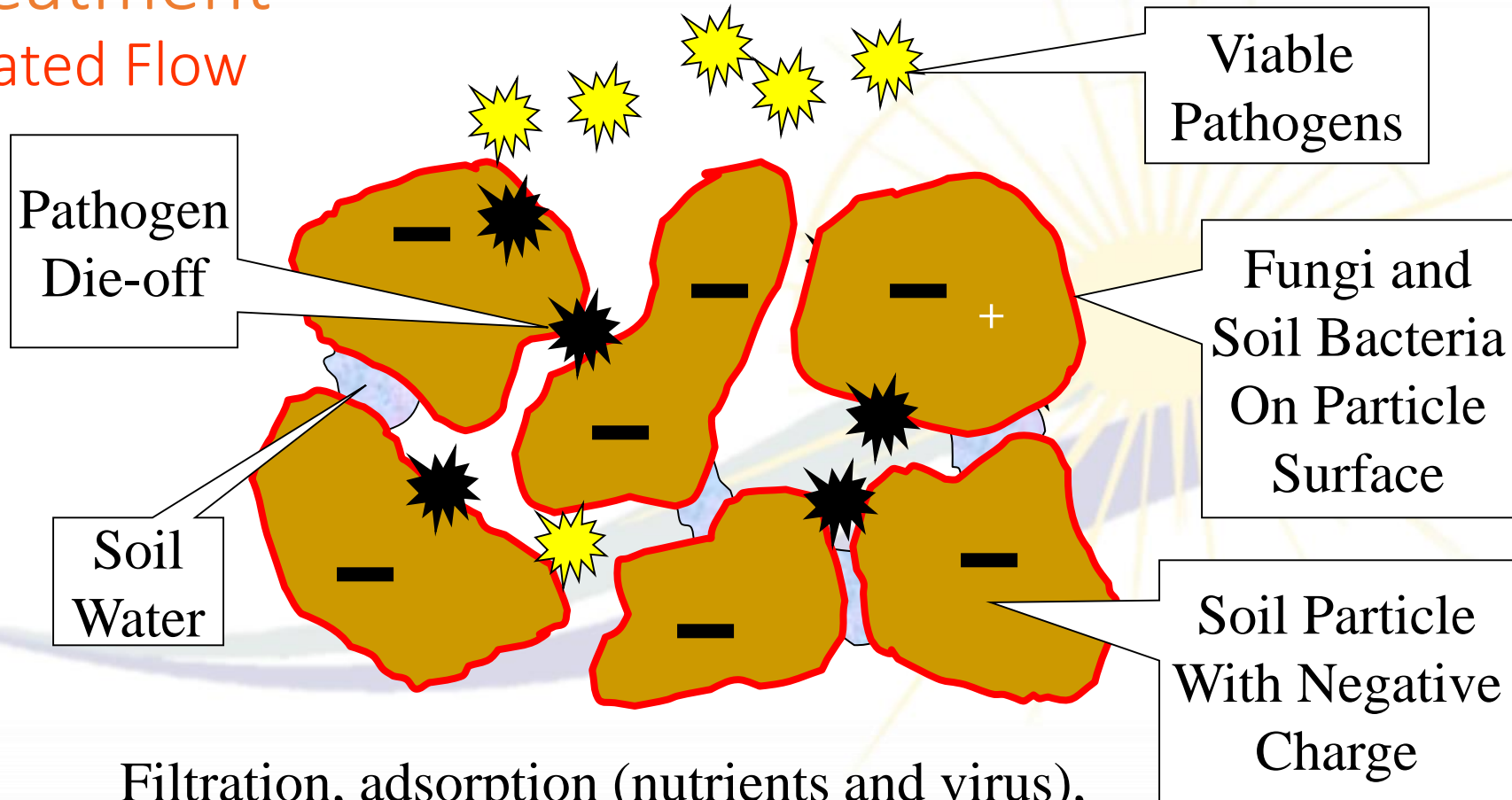
- **Vertical Separation**

- Two to five feet
- Depends on pretreatment and soil texture



Soil Treatment

Unsaturated Flow



Filtration, adsorption (nutrients and virus), predation, and retention/contact time increase treatment. Pathogens are retained on particle surfaces or in small pores.

Removal Rates

Table 3-17. Examples of soil infiltration system performance

Parameter	Applied concentration in milligrams per liter	Percent removal	References
BOD ₅	130–150	90–98	Siegrist et al., 1986 U. Wisconsin, 1978
Total nitrogen	45–55	10–40	Reneau 1977 Sikora et al., 1976
Total phosphorus	8–12	85–95	Sikora et al., 1976
Fecal coliforms	NA ^a	99–99.99	Gerba, 1975

^a Fecal coliforms are typically measured in other units, e.g., colony-forming units per 100 milliliters.

Source: Adapted from USEPA, 1992.

Failure and Contamination

- DSPS recognizes any of these as failure:
 - 1. Discharging to the ground surface
 - 2. Backing up inside the structure
 - 3. Discharging to zones of saturation, drain tile, or bedrock

Old Steel Tanks



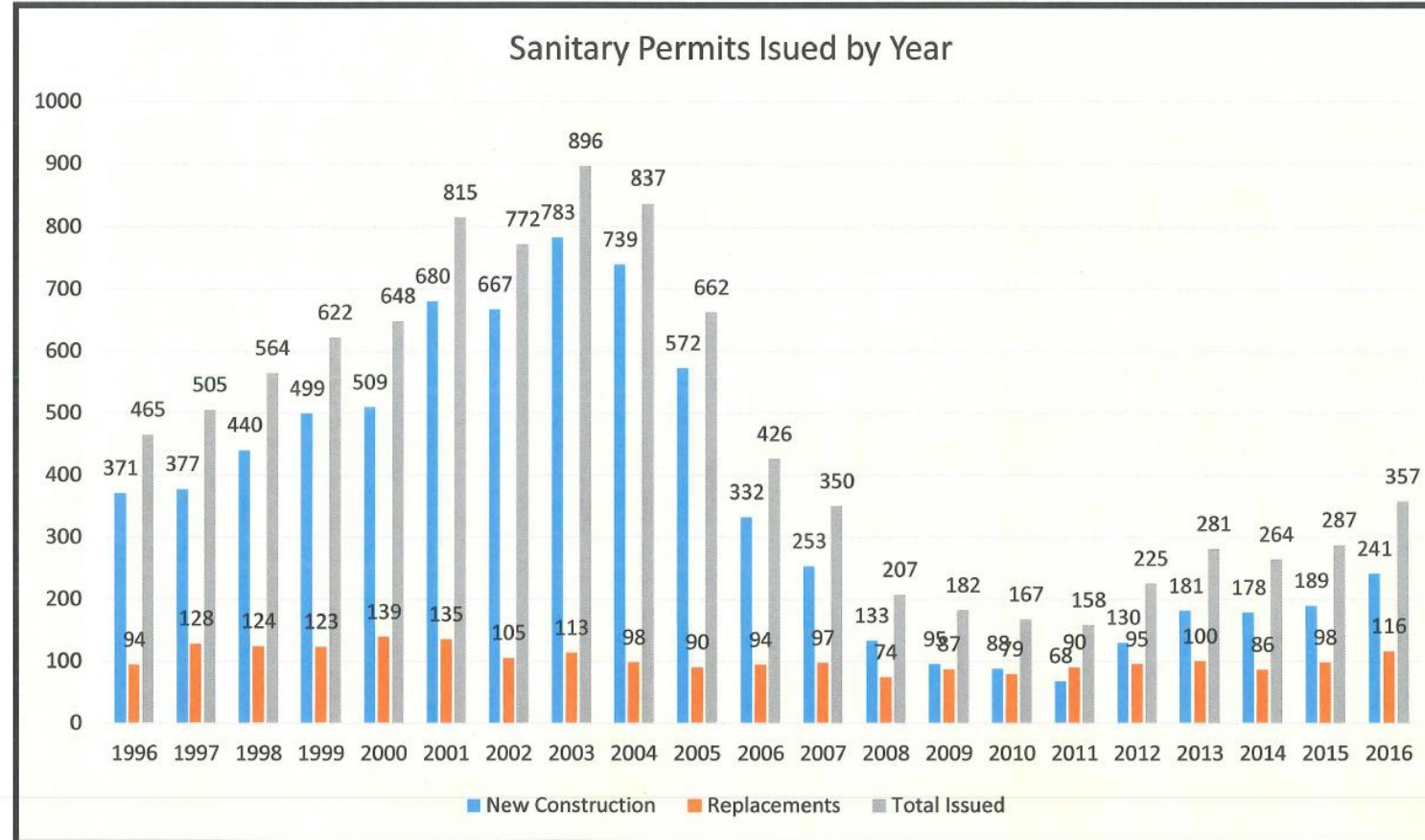
Discharge to the ground surface



Health and Safety Violations



Total Number of Systems exceed 15,300



How do we prevent Failure and Contamination

1. Soil test is required prior to the creation of any lot (CSM or Plat Map).
2. Sanitary permit is required prior to obtaining a building permit.
3. Holding Tanks are only allowed on replacement systems as a system of last resort.
4. All POWTS are inventoried and receive a three year pumping maintenance notification.
5. Time of Sale inspections are typically required by mortgage companies

Three Year Maintenance Requirement

- Remove sludge and scum before these levels exceed 1/3 of the tank volume.
- Licensed individual verifying that the system is operating properly and not a health and safety concern.



Land Application of Septage

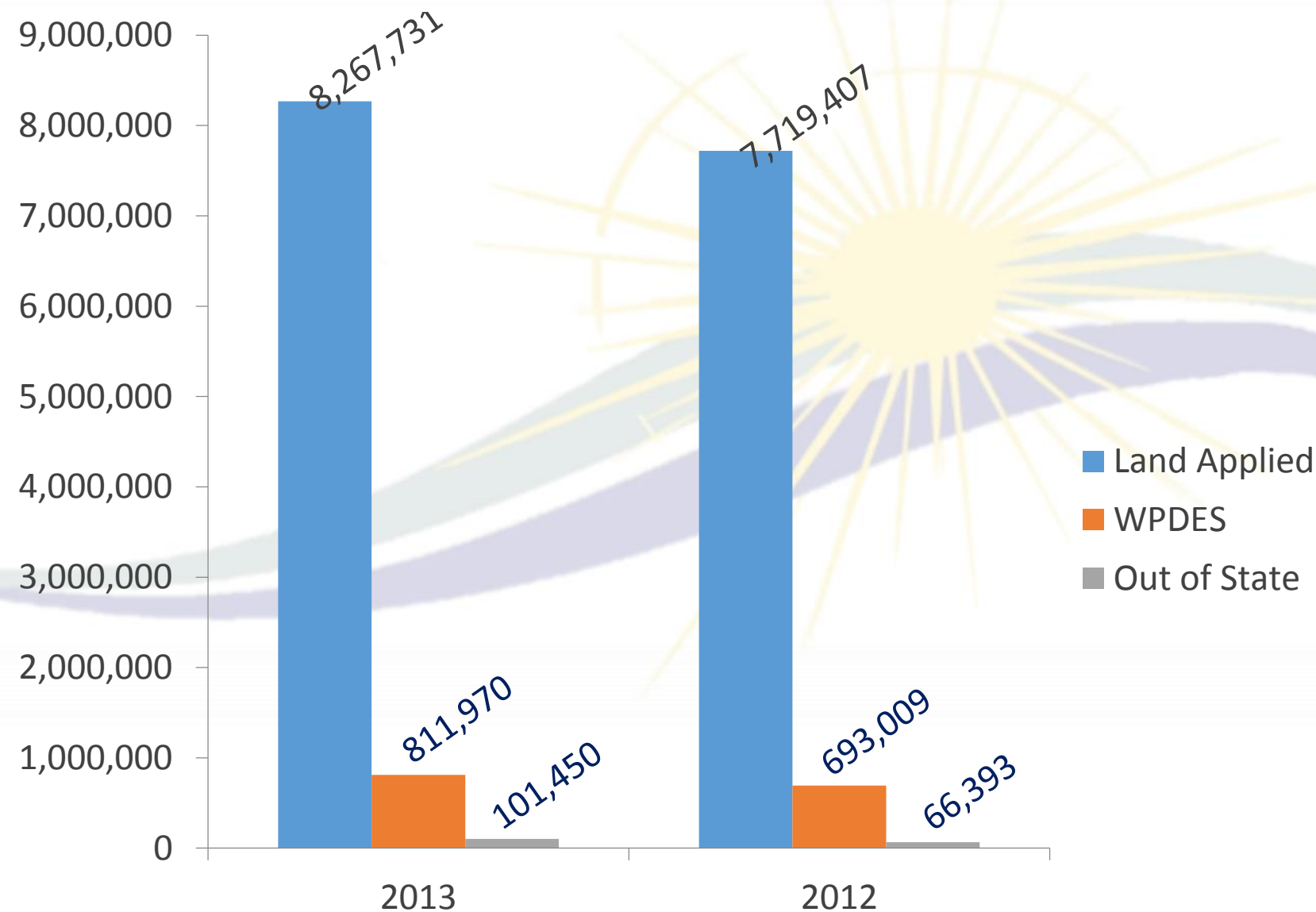
- DNR oversees permitting of sites & providers
- Application rates of septage:
 - Based on *use* of agricultural fields
 - High use – Fields with more than 39,000 gal/ac/year
 - Limited by amount of Nitrogen the crop can consume
 - Low use – Fields with less than 39,000 gal/ac/year

3 Methods to Apply Septage

- Surface application
 - Requires liming to pH of 12 for min. 30 mins
- Incorporation
 - Land applied, tilled into soil within 6 hours
 - No liming required
- Injection
 - Subsurface injection, no lime required

Which method has less potential for impacts?
Which is most costly?

2013-12 Septage Disposal



IS LAND APPLICATION OF SEPTAGE ADDING PHOSPHORUS TO GROUNDWATER?

St. Croix County 2013 → 8,267,731 gals applied

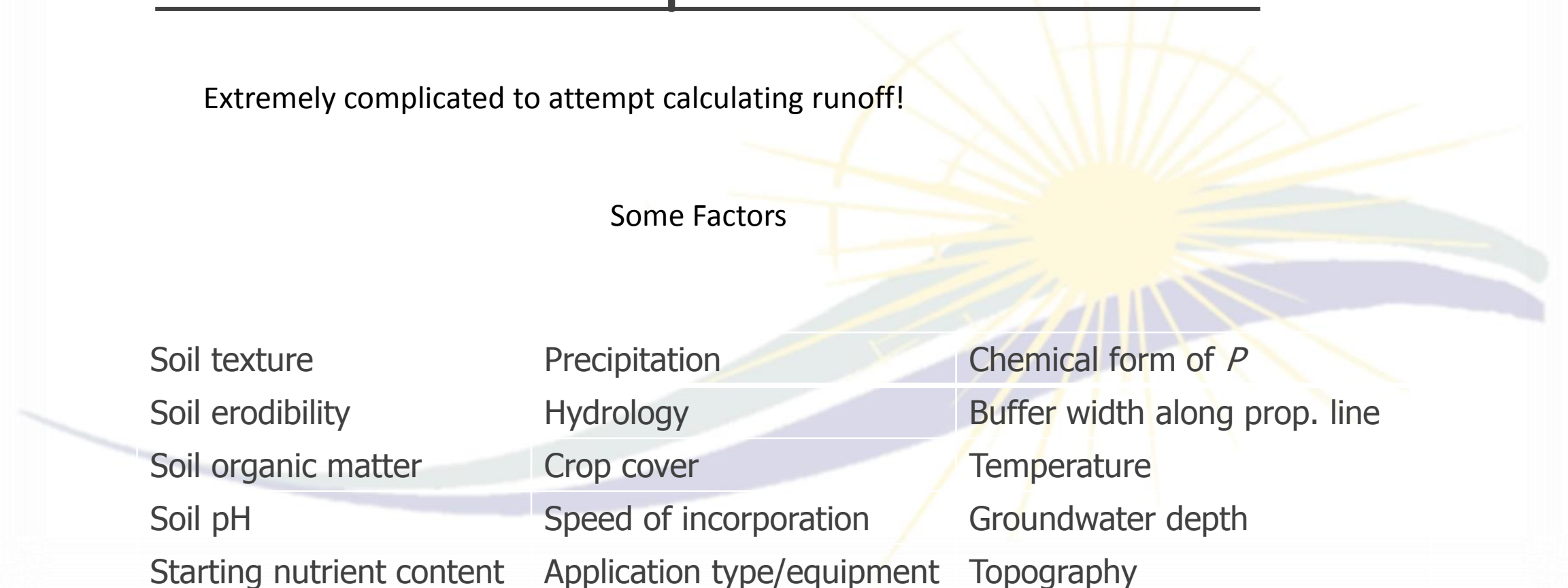
$$\pm 0.215 \frac{\text{lbs Phosphorus}}{\text{Avg Truck}} \left(\frac{8,267,731 \text{ gal}}{3000 \text{ gal/truck}} \right) \approx 2755 \text{ trucks}$$

$$\left(0.215 \frac{\text{lbs P}}{\text{truck}} \right) \times (2755 \text{ trucks}) = \mathbf{592.5 \text{ lbs P}}$$

How much Phosphorus leaves site?

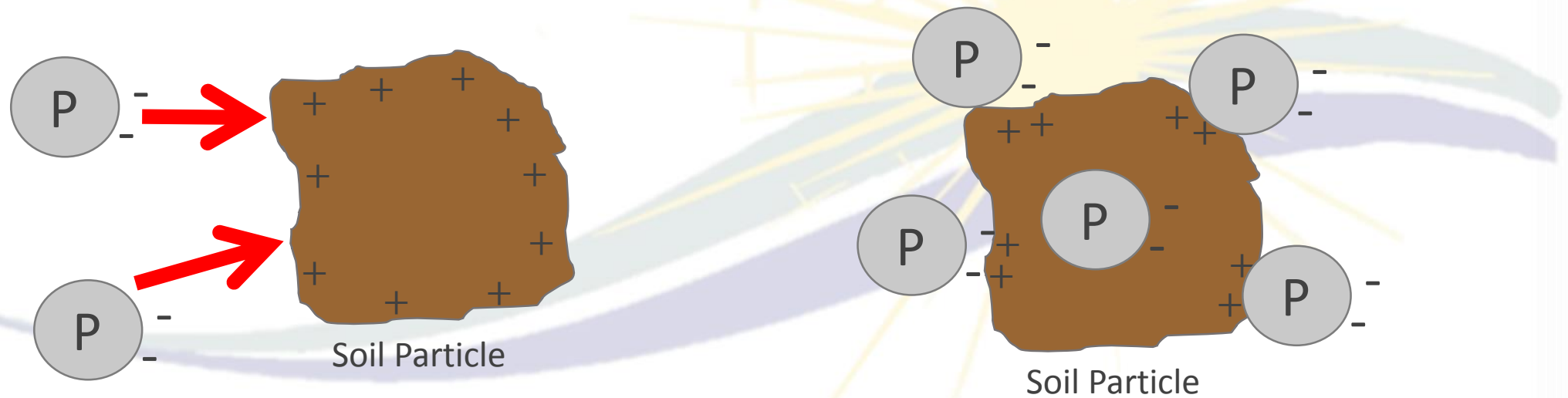
Extremely complicated to attempt calculating runoff!

Some Factors



Soil texture	Precipitation	Chemical form of <i>P</i>
Soil erodibility	Hydrology	Buffer width along prop. line
Soil organic matter	Crop cover	Temperature
Soil pH	Speed of incorporation	Groundwater depth
Starting nutrient content	Application type/equipment	Topography

Lets Explore One Example...



P wants to bind with soil particles

With NMP & sod/turf crop

86 Ac.


211 Ac.
Max 'Low' Use

1534 Ac.

AREA USED FOR APPLICATION – 2013

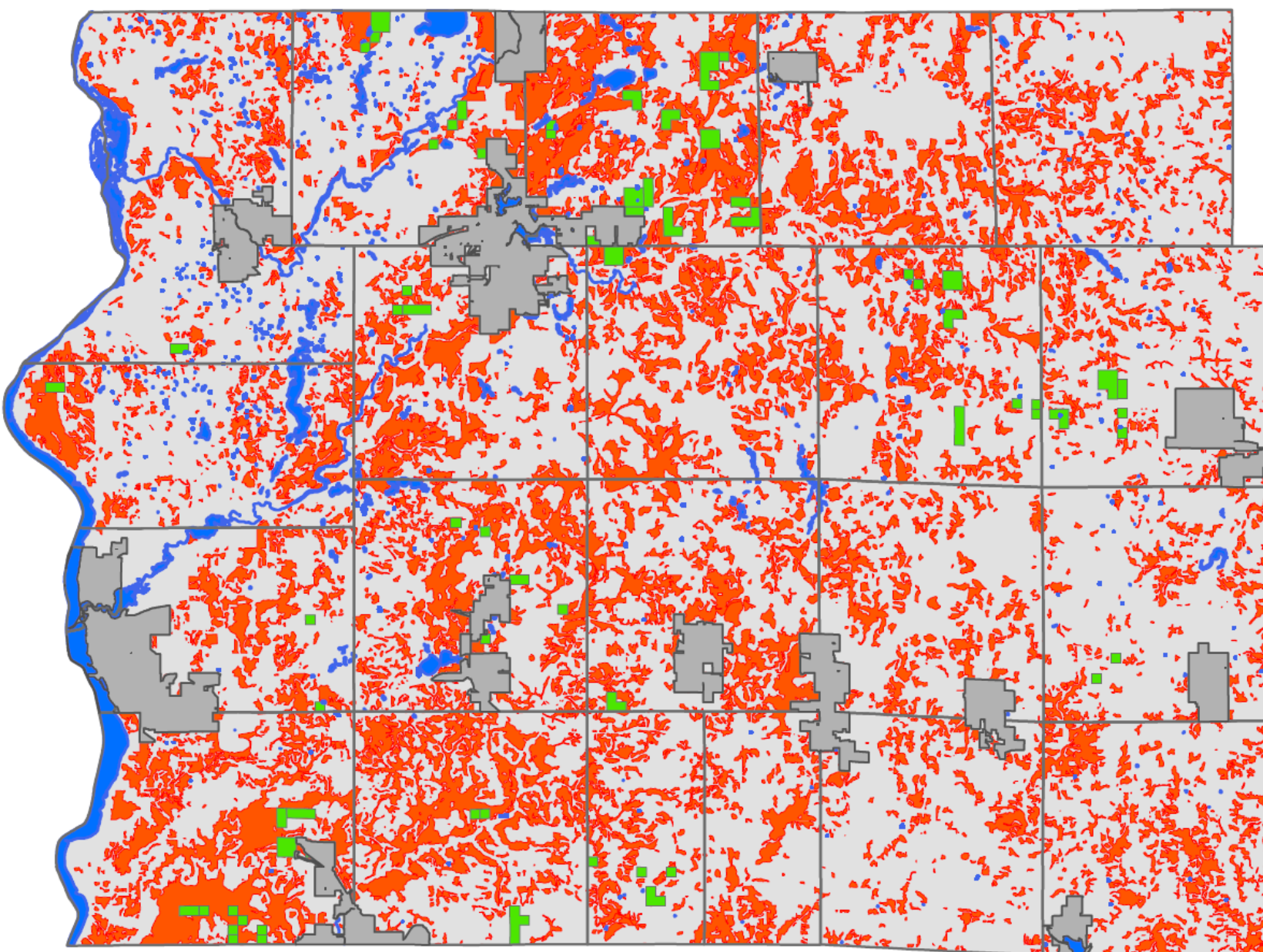
5074 Ac.

AREA PERMITTED FOR APPLICATION



Application Area 2013 = 1534 Acres
(Roughly 0.32% of County)

St. Croix County ≈ 478,000 Acres

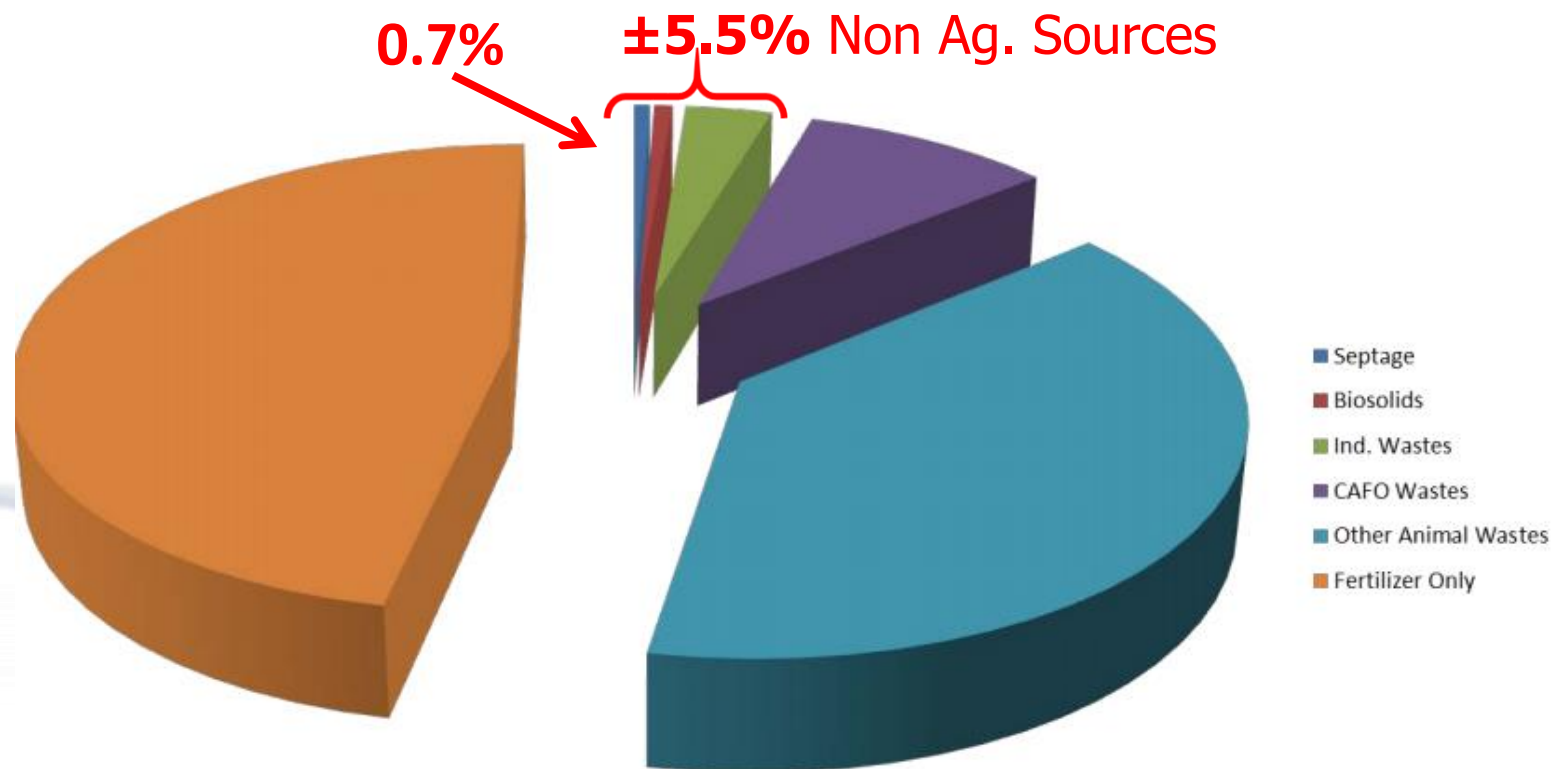


■ = Suitable for Application

■ = Permitted in 2013 for Application

Impacts of Land Applying Wastes?

SOURCES OF FERTILIZER



Courtesy of Fred Hegeman of WI DNR, image from presentation given March 14, 2014.

Take Away Points

POWTS are very good at removing phosphorus, pathogens, and pharmaceuticals, but not great at removing nitrates without additional treatment.

When sited properly POWTS and Land Application of Septage can be beneficial to recharge groundwater, recycle nutrients and reduce fertilizer needs.